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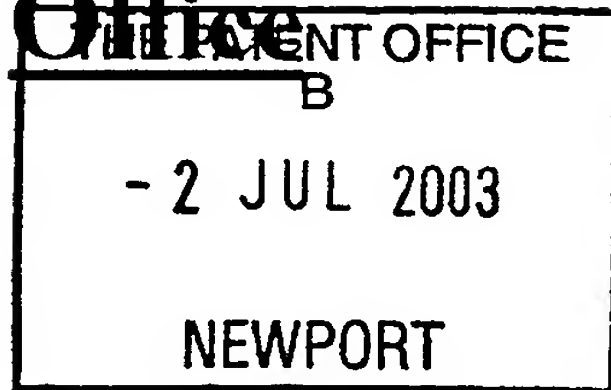
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*Stephen Hordley*

Dated 22 July 2003





# Request for grant of a patent

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The Patent Office

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1.	Your reference	JL3775		
2.	Patent application number (The Patent Office will fill in this part)	0315433.3		02 JUL 2003
3.	Full name, address and postcode of the or of each applicant (underline all surnames)	3M INNOVATIVE PROPERTIES COMPANY P.O. BOX 33427 ST. PAUL, MN 55133-3427 USA  Patents ADP number (if you know it) 8082232002  If the applicant is a corporate body, give the country/state of its incorporation DELAWARE, USA		
4.	Title of the invention	PATTERNED POLYMER ARTICLES		
5.	Name of your agent (if you have one)	Barker Brettell		
	"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	138 Hagley Road Edgbaston Birmingham B16 9PW		
	Patents ADP number (if you know it)	7442494002 ✓		
6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of Filing (day/month/year)
		GB	0216373.1	13 July 2002
7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing (day/month/year)	
8.	Is a statement of inventorship and of right to grant of a patent required in support of this request (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))	YES		

## Patents Form 1/77

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Description 28 + 28

Claim(s) 9 + 9

Abstract 1 + 1

Drawing(s) 10 + 10

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Priority documents -

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Statement of inventorship and right to grant of a patent (*Patents Form 7/77*) -

Request for preliminary examination 1  
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11. I/We request the grant of a patent on the basis of this application.

Signature

*Barker Brettell*

Date

**Barker Brettell**

01.07.03

12. Name and daytime telephone number of person to contact in the United Kingdom

D. WIGHTMAN

Tel: 0121 456 1364

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DUPLICATE

## PATTERNED POLYMER ARTICLES

### Field of the Invention

5 This invention concerns improvements in or relating to polymer articles. More especially, the invention relates to polymeric foam articles and a method of manufacturing polymeric foam articles with a surface pattern applied to an area of the article. The invention has particular, but not exclusive, application to such foam articles for use as masking materials  
10 when painting a vehicle.

### Background of the Invention

In our co-pending UK patent application No.021637.1 filed 13 July 2002  
15 we disclose polymeric foam articles for use as a masking material comprising an elongate strip of foam material having a flexible web portion extending along the length of the strip and having a width transverse to the length of the strip wherein the web portion is formed by a shaping process in which an area of the foam material is deformed  
20 under pressure so that, when the pressure is removed, the web portion is produced in the deformed area.

We further disclose applying a surface pattern to the flexible web portion during the shaping process to provide the web portion with any desired  
25 properties of stress relief, stiffness, strength or flexibility in a particular plane or direction.

MEMORANDUM  
1 JUL 2002  
BY  
EXAMINER

The present invention develops and extends the application of surface patterns to the masking materials disclosed in our afore-mentioned application to foam articles generally.

- 5 At least some embodiments provide surface patterns for a range of uses both functional and decorative as well as methods of forming the surface patterns.

### Summary

10

According to a first aspect of the present invention there is provided a polymer article provided with a surface pattern applied to an area of the article that has been formed to a desired shape by deforming the area under pressure so that, when the pressure is removed, the desired shape is  
15 produced in the deformed area.

The shaping process may be applied to an open or closed cell polymer material to compress and fuse the cells together. The shaping process may result in complete or partial compression and fusing of the cells  
20 together. The shaping process may result in the compression and fusing of the cells being permanent so as to retain and maintain the desired shape of the article. Alternatively, the compression and fusing of the cells may be semi-permanent so that the desired shape of the article is retained and maintained for a period of time after which the article reverts to its  
25 original or substantially original shape. For example, we may use a semi-permanent shape to indicate the useable life of an article.

Depending on the material of the article and the pressure applied, the deformation of the material may be sufficient to cause the material to retain the desired shape without any additional energy input during the shaping process. In some case, however, the shaping process may be enhanced by providing an additional input of energy to assist in retaining the desired shape of the article when the pressure is removed. This may be achieved in a variety of ways. For example by increasing the pressure applied to deform the material, or by the application of heat to the material or by other means such as electromagnetic radiation or ultrasonics.

The surface pattern may be functional to provide the article with desired properties or decorative to enhance the aesthetics of the article or a combination of both.

In one embodiment, the surface pattern may modify the physical properties of the area to which it is applied. For example, the surface pattern may include formations such as ribs arranged to provide stress relief or alter the stiffness, strength or flexibility of the shaped area.

In another embodiment, the surface pattern may provide or include a visual display of information. For example the information may be in the form of indicia such as letters, numerals, symbols or pictures applied to the shaped area. Such information may identify the article and/or the manufacturer providing the end user with information identifying genuine articles. Alternatively or additionally, the information may provide instructions for use of the article.

Advantageously, the surface pattern is applied during the shaping process. For example, formers such as shaping dies and/or cutting blades may be provided with a contact surface adapted to provide the desired surface pattern in the compressed polymeric material. By applying the surface  
5 pattern in this way, the pattern cannot be easily removed, defaced or altered without such changes being visibly obvious. Alternatively, the surface pattern may be applied before or after the shaping process, for example by laser cutting or other suitable forming/shaping technique.

10 The surface pattern may be provided on one or both sides of the shaped area. Where the surface pattern is applied to one side during the shaping process, the reverse of the surface pattern is formed on the opposite side. Thus, we may shape an area of the article in the nip between a pair of rollers having a surface pattern applied to the surface of one or both  
15 rollers, for example etched in the surface of the roller.

We may apply a surface pattern to each side during the shaping process and offset the patterns so that the reverse pattern does not interfere with the pattern applied to the opposite side. Alternatively, we may apply  
20 surface patterns to both sides so that the reverse pattern overlaps with the pattern applied to the opposite side.

Where we apply surface patterns to both sides that are offset so as not to interfere with each other, the patterns may be the same or different and  
25 may be offset in the longitudinal direction of the article. For example we may apply a decorative pattern to one side and information to the other side.



Where we apply surface patterns to both sides that overlap, the patterns may co-operate to produce a combined surface pattern on both sides that may be decorative and/or provide information.

- 5 Where the surface pattern is applied separately from the shaping process, for example by laser cutting, the pattern may be applied to one side only. Alternatively, patterns may be applied to both sides. The patterns so formed may be the same or different and may be aligned or offset.
- 10 The surface pattern may have the same surface finish, for example colour, texture, as the adjacent polymeric material. Alternatively, the surface pattern may have a different surface finish. For example, the surface pattern may be of a contrasting colour or texture. In this way, the visibility of the surface pattern can be enhanced. This may be especially
- 15 useful where the surface pattern is employed to provide information to the end user.

In one arrangement, the part of the contact surface forming the surface pattern may be provided with colouring material that is transferred to the

20 polymer material where the surface pattern is formed. Alternatively or additionally, it may be provided with a different surface finish (texture) that is imparted to the polymer material where the surface pattern is formed.

- 25 Preferably, the article is made of polymeric foam material, for example an open or closed cell polymeric foam that is resiliently compressible and can be formed to a desired shape under pressure. Foams having a density

in the range of from 20 to 30 Kg.m<sup>3</sup> are typically found to be suitable and include polyurethane, polyolefin, polyester or like foam materials.

5 In one embodiment, the shaped area is of reduced thickness relative to an adjacent area of the article. Where the article is in the form of an elongate strip for use as a masking material, the shaped area may extend along the length of the strip and may be continuous or discontinuous.

10 The shaped area may provide the article with desired properties for the intended application of the article. Thus, the shaped area may form a hinge portion extending along the length of an elongate strip to be used as a masking material such that an adjacent portion of the strip can hinge relative to the shaped area.

15 Alternatively or additionally, the shaped area may provide a tab by means of which the article can be gripped to assist handling the article in use. Where the article is in the form of an elongate strip for use as a masking material, the tab may be continuous along the length of the strip or a series of tabs may be provided spaced apart along the length of the strip.

20

The shaped area may include a seam formed by completely compressing and fusing the cells together. The seam may be continuous or discontinuous along the length of the article. The seam provides a line of weakness that may be of linear, curved or other suitable configuration to  
25 allow adjoining areas either side of the seam to be separated along the seam. For example, two or more articles may be formed together and releasably secured to each other by a seam allowing the articles to be separated from each other. Alternatively, where a tab is provided this

may be connected to the article by a seam allowing the tab to removed after the article has been secured in place.

The polymer material may be a natural or synthetic polymer. Synthetic  
5 polymers may include polyesters, polyurethanes and polyolefins. Natural  
polymers may include polyoses such as cellulose. Preferred polymer  
materials are foams but other materials including elastomers,  
thermoplastics and non-woven materials capable of being shaped under  
pressure may be used. The polymer material may be a combination of  
10 two or more polymer materials.

According to a second aspect of the present invention, there is provided a  
method of marking an article of polymer material comprising shaping an  
area of the article by applying pressure to the polymer material and  
15 applying a surface pattern to the shaped area.

Preferably, the surface pattern is formed during the shaping process to  
compress the polymer material. The surface pattern may be inset below  
the adjacent surface of the shaped area. Alternatively, the surface pattern  
20 is raised above the adjacent surface of the shaped area. For example a  
shaping die forming the shaped area may be provided with a contact  
surface in which the surface pattern is raised above or inset below the  
contact surface.

25 According to a third aspect of the present invention, there is provided  
apparatus for manufacturing an article of polymer material comprising  
means for compressing a portion of the article to form an area of reduced  
thickness, and means for applying a surface pattern to the area so formed.

The compression means may comprise a former such as a shaping die or blade having a contact surface for forming the area of reduced thickness by compressing the polymer material. The surface pattern applying  
5 means may comprise a portion of the contact surface in which the surface pattern is provided. In this way, the surface pattern is formed as an integral part of the compressed area.

According to a fourth aspect of the invention, there is provided an  
10 elongate foam strip for use as a masking material to mask a gap between two relatively movable parts, the foam strip having an adhesive stripe for releasably securing the foam strip to one of the parts to close temporarily the gap, and a surface pattern provided in an area that has been formed to a desired shape under pressure.

15

These and other features, benefits and advantages of the invention will be more fully understood from the description hereinafter of exemplary embodiments of articles according to the invention and methods and apparatus for making such articles.

20

### **Brief Description of the Drawings**

**Figure 1** shows a diagrammatic cross-section of a foam article for use as a masking material disclosed in our co-pending UK patent  
25 application No.0216373.1;

**Figure 2** shows a method and apparatus for making the foam article shown in Figure 1;

**Figure 3** shows an adhesive delivery system for use with the method and apparatus of **Figure 2**;

5       **Figure 4** shows application of the foam article of **Figure 1** as a masking material for masking a gap between two parts of a vehicle;

10       **Figures 5 to 14** show alternative patterned contact surfaces for applying surface patterns to the connecting web of the foam article shown in **Figure 1** using the method and apparatus of **Figure 2**, wherein the contact surfaces in **Figures 8 to 14** are of enlarged scale compared to the contact surfaces in **Figures 5 to 7**;

15       **Figure 15** shows a diagrammatic perspective view of another foam article for use as a masking material according to the present invention;

**Figure 16** is a section on the line 16-16 of **Figure 15**;

20       **Figure 17** is a section on the line 17-17 of **Figure 15**;

**Figure 18** shows a diagrammatic perspective view of yet another foam article for use as a masking material according to the present invention;

25

**Figure 19** is an end view of the foam article shown in **Figure 18**;

**Figure 20** is an end view of the foam article shown in **Figure 18** with the cord and tab separated;

5 **Figure 21** shows a diagrammatic perspective view of a still further foam article for use as a masking material according to the present invention;

**Figure 22** is a section on the line 22-22 of **Figure 21**;

10 **Figure 23** is a section on the line 23-23 of **Figure 21**;

**Figure 24** shows a diagrammatic perspective view of a foam article for use as a packing material according to the present invention;

15 **Figure 25** is a section on the line 25-25 of **Figure 24**;

**Figure 26** is a section on the line 26-26 of **Figure 24**; and

20 **Figure 27** shows a diagrammatic perspective view of a foam article for use as adhesive backed tape according to the present invention.

### **Detailed Description of the Exemplary Embodiments**

25 There is shown in **Figures 1 to 3** a foam article 10 and apparatus for making the foam article 10 as disclosed in our co-pending UK patent application No.0216373.1 the contents of which are incorporated herein by reference. The article 10 is for use as a masking material between two parts of a vehicle when the vehicle is spray painted as shown in **Figure 4**.

As shown in Figure 1, the foam article 10 comprises an elongate foam strip 11 having two lobes 12, 13 of elliptical cross-section connected by an integral web 14. Each lobe 12, 13 has a major axis transverse to the length of the foam strip 11 and the connecting web 14 is aligned with the major axis of each lobe 12, 13.

In this embodiment the lobes 12, 13 are of different cross-section and the thickness of the web 14 transverse to the length of the foam strip 11 is less than the thickness of both lobes 12, 13 transverse to the length of the foam strip 11. It will be understood, however, that this is not essential and that the lobes 12, 13 and connecting web 14 can be of different shapes as disclosed in our aforementioned co-pending UK patent application.

15

Suitable dimensions for the foam article 10 are given in Table 1 for masking gaps of varying size and shape commonly found in automotive vehicles, especially cars, in different locations, for example between a front or rear door, or hood or trunk or tailgate and the adjacent vehicle body.

20

**Table 1**

A (Thickness)	B (Width)	C (Width)	C' (Thickness)	D (Width)	E (Thickness)
4.5mm	4.5mm	3.5mm	1mm	13.5mm	12mm

It will be understood these dimensions are given by way of non-limiting example only and any dimension may be altered according to the particular requirement for any given application of the foam strip 11.

- 5 The foam strip 11 may be made from any suitable polymeric foam material. Preferred foam materials are polyesters or polyurethanes or polyolefins but it will be appreciated that other foam materials may be used as will be familiar to those skilled in the art.
- 10 In this embodiment, the foam strip 11 is a polyester or polyurethane foam. A suitable foam is available from Caligen Foam Limited under the trade designation "X4200AM" although it will be understood that other foam materials may be used.
- 15 The foam strip 11 is provided with a longitudinally extending adhesive stripe 15 on one side of the web 14 by means of which the foam strip 11 can be releasably secured in position. In other embodiments (not shown), the adhesive stripe may extend onto part or all of the lobe 13. The adhesive stripe 15 may be a pressure sensitive adhesive such as a hot melt  
20 rubber adhesive applied by any suitable means, for example die coating.

In this embodiment, the adhesive stripe 15 is applied across the full width of the web 14 but it will be appreciated that this is not essential and the adhesive stripe 15 may be applied across part of the width of the web 14.

- 25 The adhesive stripe 15 may also be continuous or discontinuous in the longitudinal direction provided that the foam strip 11 is effectively anchored in position to permit the lobes 12,13 to move independently without motion of one lobe causing motion of the other lobe.



The method and apparatus for forming the foam article 10 of Figure 1 will now be described with reference to Figures 2 and 3 starting from a flat sheet 16 of foam.

5

As shown in Figure 2, the foam sheet 16 is provided with a plurality of uniformly spaced, parallel, seams 18 extending longitudinally of the foam sheet 16 by the application of pressure via a plurality of laterally spaced blades 17. The blades 17 have blunt ends approximately 0.5 mm wide  
10 that compress the foam so that the upper and lower surfaces fuse together along the seams 18 and prevent the foam returning to its original shape on removal of the pressure.

The foam sheet 16 is also compressed between the seams 18 to form the  
15 webs 14 by the application of pressure via a plurality of flat blades 19. One blade 19 is provided between each pair of blades 17 and is offset towards one of the blades 17. The ends of the blades 19 are wider than the blades 17 and they only partially compress an area of the foam sheet 16 between the seams 18 so that the foam material is prevented from  
20 returning to its original shape on removal of the pressure.

In this way, the desired shape of the foam article 10 having two elliptical lobes 12, 13 of different transverse cross-section connected by the flat web 14 is produced. The foam sheet 16 is separable along the seams 18  
25 to form individual foam strips 11.

The stripe 15 of pressure sensitive adhesive can be applied to the web 14 before or after separating the foam strips 11 along the seams 18 by a

suitable adhesive delivery system such as that shown diagrammatically in Figure 3. The system comprises a plurality of separate, individual dies 20 positioned above the connecting webs 14 of the foam strips 11. The dies 20 are supplied with adhesive from a remote source (not shown) via  
5 separate flow channels 21 and apply the adhesive stripes 15 to the connecting webs 14 of the foam strips 11.

The foam strips 11 can be stored and supplied in rolls of pre-determined length wound on itself or a core (not shown) from which the end user can  
10 unwind and separate a required length. More than one foam strip 11 may be wound on a common core either separately or joined together by the seams 18 and manually separated by the end user when unwinding a desired length of the foam strip 11.

15 As will be appreciated, the relative size of the lobes 12, 13 is determined by the offset of the flat blades 19 between the blades 17 and can be varied to provide any desired shape of foam article 10. The spacing of the lobes 12, 13 can also be altered by changing the width of the flat blades 19.

20 In the above method, the foam sheet 16 is compressed by the blades 17, 19 while the foam sheet 16 is stationary and the foam sheet 16 is formed to the required shape in a series of steps by advancing the sheet 16 between forming operations to present a new area of the sheet 16 to be shaped. In another method (not shown), the blades 17, 19 are replaced by  
25 rotatable discs and the foam sheet 16 is formed to the required shape in a continuous manner by feeding the sheet 16 past the discs.

Referring now to Figure 4, the foam strip 11 is shown masking the gap 3 between the door 1 and post 2 of a vehicle when the vehicle is spray painted. The foam strip 11 is secured to the base face of the post 2 by means of the adhesive stripe 15 so that an adhesive free surface of the smaller lobe 12 contacts the side face of the post 2 at point Y.

The larger lobe 13 is folded upwards by contact with the base face of the post 2 so that an adhesive free surface of the lobe 13 contacts the inside face of the door 1 at point X when the door 1 is closed. In this way, the gap 3 is closed to prevent paint passing through the gap 3 when the vehicle is spray painted.

As will be understood, the web 14 permits the lobes 12, 13 to move independently of each other so that forces applied to the lobe 13 by the door 1 are not transferred to the lobe 12.

In this way, the adhesive free contact between the lobe 12 and the side face of the post 2 is unaffected by compression of the lobe 13 and the adhesive stripe 15 is concealed preventing formation of a hard edge when the vehicle is spray painted.

Furthermore, the foam strip 11 can adapt to close gaps 3 of different size and/or shape by hinging movement of the lobe 13 about the web 14 and this movement does not cause the position of the lobe 12 to change.

25

Accordingly, there is no tendency for the lobe 12 to lift off the side face of the post 2 to expose the adhesive stripe 15 when the door 1 is closed.

In this way, a soft edge is formed at the interface between the unmasked surface of the post 2 and the adhesive free surface extending lengthwise of the strip where the edge of the lobe 12 contacts the side face of the post 2 at point Y.

5

A soft edge is also formed at the interface between the unmasked surface of the door 1 and the adhesive free surface extending lengthwise of the strip where the edge of the lobe 13 contacts the inner face of the door 1 at point X.

10

As will be understood, the function of filling the gap 3 to prevent paint passing through the gap 3 is performed by engagement of the lobes 12, 13 with faces of the post 2 and door 1.

15 Moreover, the foam strip 11 can adapt to fill gaps 3 of different size and shape independently of the edge forming function performed by each lobe 12, 13 where it contacts the face of the post 2 and door 1.

20 As a result, soft edges can be formed between painted and masked areas on both the post 2 and door 1.

In this embodiment, the lobe 12 provides an adhesive free region that extend lengthwise of the strip on one side of the adhesive stripe 15 and has a transverse width of 4.5mm (Table 1).

25

We have found that the adhesive free region can be of narrower width without exposing the adhesive stripe 15 and, in general, a width of 2mm may be sufficient to maintain contact between an adhesive free surface of

the lobe 12 and the part to which the strip is anchored by the adhesive strip.

5 The connecting web 14 may have a flat surface formed by compressing the foam material with blades 19 having a smooth contact surface. More preferably, in accordance with the present invention, the connecting web 14 has a surface pattern formed by compressing the foam material with blades having a patterned contact surface. In this way, the surface pattern applied to the connecting web 14 is formed integrally from the foam  
10 material during the shaping process. As a result, the surface pattern cannot be removed or altered without defacing the article so as to be readily apparent to a user of the article.

The surface pattern may be decorative. For example, the surface pattern  
15 may provide the connecting web 14 with a visually distinctive appearance so as to enhance the aesthetics of the article 11. Alternatively or additionally, the surface pattern may be functional. For example, the surface pattern may modify the physical properties or characteristics of the connecting web 14 to adapt the article 11 for a particular application.  
20 Alternatively, the surface pattern may provide a visual indication of information identifying the article or its source or its use. For example the surface pattern may comprise indicia applied to the connecting web 14. The indicia may be letters, numerals, symbols or pictures in the form of text or graphics.

25

The surface pattern may be inset (recessed) into the surface of the connecting web 14 by providing a raised (elevated) pattern on the contact surface of the blades 19. Alternatively, the surface pattern may be raised

(elevated) above the surface of the connecting web 14 by providing an inset (recessed) pattern in the contact surface of the blades 19.

5 The contact surface of the blades 19 may be provided with colouring material that is transferred to the foam of the connecting web 14 so that the surface pattern on the web 14 has a contrasting colour to that of the remainder of the web 14. In this way, the visual appearance of the surface pattern is enhanced.

10 Alternatively or additionally, the visual appearance of the surface pattern may be enhanced by providing the contact surface of the blades 19 that forms the surface pattern with a different surface finish such that the resulting surface pattern has a different surface finish, for example texture, relative to the surface finish of the adjacent surface of the web  
15 14.

Referring now to Figures 5 to 14, these show examples of the contact surfaces of blades 19 that can be employed to apply a surface pattern having a decorative and/or functional nature to the connecting web 14.

20

Figure 5 shows a blade 19 having a contact surface 19a with an array of recessed notches 23 that form a plurality of raised parallel ribs extending in the longitudinal direction of the foam strip 11 that increase bending of the web 14 in this direction.

25

Figure 6 shows a blade 19 having a contact surface 19b with an array of recessed notches 24 that form a plurality of raised parallel ribs extending

transversely to the longitudinal direction of the foam strip 11 that increase stiffness of the web 14 against bending in this direction.

Figure 7 shows a blade 19 having a contact surface 19c with an array of recessed notches 25 that form a plurality of raised parallel ribs extending at an angle of between  $0^{\circ}$  and  $90^{\circ}$  to the longitudinal direction of the foam strip 11 that modify the bending and stiffness properties of the connecting web 14.

Figure 8 shows a blade 19 having a contact surface 19d with an array of recessed notches 26 that form a plurality of raised chevrons that extend in the longitudinal direction of the foam strip 11 that modify the bending and stiffness properties of the connecting web 14.

Figure 9 shows a blade 19 having a contact surface 19e with an array of recessed notches 27 that form a plurality of raised wavy ribs extending in the longitudinal direction of the foam strip 11 that modify the bending and stiffness properties of the connecting web 14.

Figure 10 shows a blade 19 having a contact surface 19f with an array of recessed notches 28 that form a plurality of raised wavy ribs extending transversely to the longitudinal direction of the foam strip 11 that modify the bending and stiffness properties of the connecting web 14.

As will be appreciated, each of the contact surfaces 19a to 19f provide the connecting web 14 with a surface pattern that modifies the physical properties of the web 14 i.e. is functional and that can also provide the



connecting web 14 with an aesthetically pleasing appearance i.e. is decorative.

5 The blades 19 may be arranged so that the surface pattern provided by each of the contact surfaces 19a to 19f is substantially continuous in the longitudinal direction of the strip 11. Alternatively, the blades 19 may have contact surfaces 19a to 19f arranged so that the surface pattern is discontinuous in the longitudinal direction with breaks or gaps in the surface pattern in the longitudinal direction being provided at regular or  
10 irregular intervals. The breaks or gaps may be provided with an alternative form of marking as described below.

It will also be understood that the surface patterns produced by the contact surfaces 19a to 19f are exemplary only of the invention and that  
15 blades 19 having other shapes and configurations of recessed notches in the contact surface may be employed to provide any desired surface pattern on the connecting web 14. For example, Figure 11 shows a blade 19 with a contact surface 19g having an array of recessed notches 29 that form a decorative surface pattern of raised circular ribs that is repeated in  
20 the longitudinal direction of the foam strip 11.

Referring now to Figures 12 to 14, these show examples of the contact surfaces of blades 19 that can be employed to apply a surface pattern to the connecting web 14 in the form of indicia so as to provide the user  
25 with information relating to the article. For example to identify the article or its source or its use.



Figure 12 shows a blade 19 having a contact surface 19h provided with recessed notches 30, 31 that form the raised numeral "3" and the raised letter "M" arranged to apply the marking "3M" to the connecting web 14 to identify the manufacturer of the strip 11.

5

The marking "3M" is repeated at spaced intervals in the longitudinal direction of the strip 11 and the surface area of the connecting web 14 between such markings may be plain or provided with a surface pattern such as any of the patterns shown in Figures 5 to 11. Figure 13 shows a  
10 blade 19 having a contact surface 19i combining the recessed notches 24 of Figure 6 with the recessed notches 30,31 shown in Figure 12 to provide the connecting web with the marking "3M" alternating with transverse ribs in the longitudinal direction of the foam strip.

15 It will be understood that any combination of letters and/or numbers may be employed to identify the article, for example a product code and/or the source, for example manufacturer. It will also be understood that the marking may consist of letters and/or numbers arranged to provide instructions for the use of the article.

20

Figure 14 shows a blade 19 having a contact surface 19j provided with recessed notches 32 that form a symbol or picture on the connecting web 14 that is repeated at spaced intervals in the longitudinal direction of the strip 11. Again the symbol or picture may be combined with any of the  
25 other forms of surface pattern described herein.

Each of the contact surfaces 19a to 19j of the blades 19 shown in Figures 5 to 14 applies a surface pattern to one side of the compressed area and

the reverse of the surface pattern is formed simultaneously on the opposite side. We may arrange for surface patterns to be applied to both sides of the compressed area and to offset the surface patterns so that the reverse patterns so formed do not interfere with the surface patterns.

- 5 This may be desirable where the surface pattern includes information in the form of letters and/or numerals. Offset surface patterns applied to both sides of the compressed area may be the same or different.

- 10 In another embodiment (not shown), we may arrange for surface patterns applied to both sides of the compressed area to overlap so that the patterns co-operate to produce a desired combined pattern on both sides.

Referring now to Figures 15 to 17 there is a second embodiment of a foam article 100 according to the present invention.

15

- The foam article 100 comprises two elongate cords 101,101' of generally circular cross-section joined together by a series of compressed areas 102 of approximately diamond shape. The compressed areas 102 are arranged so that adjacent areas 102 in the longitudinal direction contact each other at the apices 102a, 102b. As shown, each of the compressed areas 102 is provided with marking "3M" to identify the manufacturer of the article 100. It will be understood that the compressed areas 102 may be provided with any other form of surface marking as described previously.

- 25 The article 100 may be produced by compressing a flat sheet of foam with a rotating blade (not shown) having a peripheral surface formed with diamond shaped formations joined at the apices in the circumferential

direction with recesses corresponding to the indicia to be applied to the article 100 provided in the diamond shaped formations.

5 The article 100 may be provided with a seam 103 (shown in outline in Figure 15) by means of which the cords 101, 101' may be separated so that the compressed areas 102 are split in half and form a respective series of triangular shaped compressed areas 102, 102' in the longitudinal direction of each cord 101, 101'. Alternatively, the cords 101, 101' may be separated with scissors.

10

The cords 101, 101' may be used as masking materials to mask a gap between two parts of a vehicle when the vehicle is being spray painted. The cords 101, 101' are secured in place by means of a longitudinal adhesive strip (not shown) applied to each cord 101, 101' and the  
15 compressed areas 102, 102' provide tabs for the user to hold the cords 101, 101' to assist positioning and securing the cords 101, 101' accurately.

20 With reference now to Figures 18 to 20, there is shown a third embodiment of a foam article 200 according to the present invention.

The foam article 200 comprises a cord 201 of generally circular cross-section for use as a masking material to mask a gap between two parts of a vehicle when the vehicle is being spray painted. The cord 201 is  
25 provided with a longitudinal flange 202 formed by compressing the foam material and with a longitudinal adhesive stripe (not shown) for securing the cord 201 in use. The flange 202 provides a tab to assist the user position and secure the cord 201 in use and is connected to the cord 201

by a seam 203 so as to be separable from the cord 201 when the cord 201 is secured in position (Figure 20). Alternatively, the flange 202 may be left in place to assist masking the gap.

5 As shown, the flange 202 is provided with a series of markings "3M" spaced apart along the length of the cord 201 to identify the manufacturer of the article 200. It will be understood that the compressed areas 202 may be provided with any other form of surface pattern as described previously.

10

Referring now to Figures 21 to 23 there is shown a fourth embodiment of a foam article 300 according to the present invention.

The foam article 300 comprises two elongate cords 301, 301' of generally  
15 circular cross-section joined together by a series of compressed areas or webs 302. The compressed areas 302 are spaced apart in the longitudinal direction by cut out areas 303 formed during the shaping process. As shown, each of the compressed areas 302 is provided with marking "3M" to identify the manufacturer of the article 300. It will be understood that  
20 the compressed areas 302 may be provided with any other form of surface marking as described previously.

The article 300 may be produced by compressing a flat sheet of foam with a rotating blade (not shown) having a peripheral surface shaped to form  
25 the compressed areas 302 and cut-out areas 303.

The cords 301, 301' may be separated by cutting through the compressed areas 302 to leave each cord 301, 301' with a series of tabs that can be

used to assist positioning the cords 301, 301' when used as masking materials to mask a gap between two parts of a vehicle during spray painting as described previously. For such application the cords 301, 301' are provided with a longitudinal adhesive stripe (not shown) to  
5 secure the cords 301, 301' in position.

As will now be appreciated, the present invention provides articles of compressible polymer material with a surface pattern applied to an area of the material that has been shaped under pressure so as to retain a desired  
10 shape when the pressure is removed. The pattern can be decorative and/or functional and may be formed simultaneously with the shaping process by appropriate construction of the contact surface of the former employed to compress the polymer material.

15 Alternatively, the pattern may be applied to the area in a separate operation, for example by laser cutting or any suitable technique before or after the shaping operation. A separate forming operation may be used to apply the surface pattern to one or both sides of the shaped area. Where the pattern is applied to one side, the other side may be plain.  
20 Where the pattern is applied to both sides, the patterns may be the same or different and may be aligned or offset.

Although the invention has been described with particular reference to articles made of polymeric foam suitable for use as masking materials  
25 when spray painting a vehicle, it will be understood that the invention is not limited to such application and that the invention can be applied to other articles made of polymeric foam that can be shaped under pressure so as to retain a desired shape when the pressure is removed.

- For example, with reference to Figures 24 to 26, there is shown application of the invention to an article 400 suitable for use as packaging for eggs or similar fragile items (not shown). As shown a sheet of foam is compressed to provide a plurality of areas 401 of generally star shape aligned in two mutually perpendicular directions to produce a convoluted surface in which each compressed area 401 forms a recess or pocket 402 in the foam sheet to receive an egg.
- 10 The areas 401 are produced by compressing the foam sheet with formers (not shown) having contact surfaces corresponding to the star shape of the areas 401. In this embodiment, the contact surfaces are formed with recessed notches that provide the areas with a surface pattern in the form of raised parallel ribs 403. It will be understood, however, that the areas
- 15 401 can be provided with any other surface pattern of decorative and/or functional nature as described herein. The article 400 is also suitable for other uses such as a sound proofing or sound deadening material in a variety of applications.
- 20 Referring now to Figure 27, there is shown application of the invention to an article 500 comprising a foam backed pressure sensitive adhesive tape 501 provided along one side edge with a flange 502 to which a surface pattern comprising the marking "3M" is applied as previously described herein. The flange 502 is formed by compressing an area of foam so as to
- 25 retain the desired shape of the flange 502 when the pressure is removed. It will be understood that any other surface pattern of a decorative and/or functional nature as described herein may be applied to the flange 502.

The flange 502 may be attached via a seam that allows the flange 502 to be separated from the tape 501 if desired.

In the above-described embodiments, an area of the article is deformed under pressure so as to retain a desired shape when the pressure applied to the area is removed. Depending on the material of the article and the pressure applied, the deformation of the material may be sufficient to cause the material to retain the desired shape without any additional energy input. For example, the applied pressure to deform the material may set the material and prevent it returning to its original shape. In some case, however, it may be desirable or necessary to provide an additional input of energy to assist in retaining the desired shape of the article when the pressure is removed. This may be achieved in a variety of ways to enhance or optimise the shaping process. For example by applying a higher pressure to the material than is required to deform it, or by the application of heat to the material or by other means such as electromagnetic radiation or ultrasonics. Heat may be applied by changing the ambient temperature or by heating the formers used to shape the material or in any other suitable manner. Any one or more of these means for inputting additional energy may be employed separately or in combination.

It will be understood that the above-described examples are intended to illustrate the diverse range and application of the invention and that features of the embodiments may be used separately or in combination with any other feature of the same or different embodiments to produce an article with a surface pattern applied to an area of the article that has



been compressed so as to retain a desired shape when the pressure is removed.

Thus, it will be appreciated that the invention has general application to  
5 any article made of compressible polymer material, especially foam  
articles, to which a decorative and/or functional surface pattern may be  
applied to a compressed area for any desired purpose. For example, the  
invention may be applied to headliners for cars, carpet underlay and other  
articles to which a surface pattern can be usefully applied.

10

Moreover, while the specific materials and/or configuration of the articles  
described and illustrated are believed to represent the best means  
currently known to the applicant for producing articles having a surface  
pattern applied to an area that has been compressed so as to retain a  
15 desired shape when the pressure is removed, it will be appreciated that  
the invention is not limited thereto and that various modifications and  
improvements can be made within the spirit and scope of the claims.



**CLAIMS**

1. A polymer article provided with a surface pattern applied to an area of the article that has been formed to a desired shape by deforming  
5 the area under pressure so that, when the pressure is removed, the desired shape is produced in the deformed area.
2. A polymer article according to claim 1 wherein the surface pattern is functional.  
10
3. A polymer article according to claim 2 wherein the surface pattern modifies a physical property of the article.
4. A polymer article according to claim 3 wherein the surface pattern  
15 modifies at least one of the stress, stiffness, strength or flexibility of the article.
5. A polymer article according to claim 2 wherein the surface pattern provides or includes a visual display of information.  
20
6. A polymer article according to claim 5 wherein the information comprises one or more of indicia.
7. A polymer article according to claim 6 wherein the indicia include  
25 one or more of letters, numerals, symbols or pictures.
8. A polymer article according to any one of claims 5 to 7 wherein the information identifies the article and/or the manufacturer.

9. A polymer article according to any one of claims 5 to 7 wherein information provides instructions for use of the article.

5 10. A polymer article according to claim 1 wherein the surface pattern is decorative.

11. A polymer article according to any one of the preceding claims wherein the surface pattern is applied during the shaping process.

10

12. A polymer article according to claim 11 wherein the surface pattern is applied with a former having a contact surface adapted to provide the desired surface pattern in the compressed polymer material.

15 13. A polymer article according to claim 11 or claim 12 wherein the surface pattern is applied to one side of the compressed area and the reverse pattern is formed on the opposite side.

20 14. A polymer article according to any one of claims 11 to 13 wherein surface patterns are applied to both sides of the compressed area.

15. A polymer article according to claim 14 wherein the surface pattern on one side is offset relative to the surface pattern on the other side.

25

16. A polymer article according to claim 14 wherein the surface pattern one side overlaps the surface pattern on the other side.

17. A polymer article according to any one of claims 14 to 16 wherein the surface patterns on each side are the same.
18. A polymer article according to any one of claims 14 to 16 wherein  
5 the surface patterns on each side are different.
19. A polymer article according to any one of the preceding claims wherein the surface pattern is the same colour as the adjacent polymer material.  
10
20. A polymer article according to any one of claims 1 to 18 wherein the surface pattern is of a contrasting colour relative to the adjacent polymer material.
- 15 21. A polymer article according to any one of the preceding claims wherein the surface pattern is raised relative to the adjacent polymer material.
22. A polymer article according to any one of claims 1 to 20 wherein  
20 the surface pattern is recessed relative to the adjacent polymer material.
23. A polymer article according to any one of the preceding claims wherein the article is made of polymeric foam material.
- 25 24. A polymer article according to claim 23 wherein the polymeric foam is an open or closed cell polymeric foam that is resiliently compressible and can be deformed under pressure so as to retain the desired shape when the pressure is removed.

25. A polymer article according to claim 23 or claim 24 wherein the polymeric foam has a density in the range of from 20 to 30 Kg.m<sup>3</sup> .
- 5 26. A polymer article according to any one of claims 23 to 25 wherein the polymeric foam is selected from the group comprising polyurethane, polyolefin and polyester foam materials.
- 10 27. A polymer article according to any one of claims 1 to 22 wherein the article is made of polymeric material selected from the group comprising elastomers, thermoplastics and non-woven materials.
- 15 28. A polymer article according to any one of the preceding claims wherein the article is in the form of an elongate strip.
- 20 29. A polymer article according to claim 28 wherein the compressed area extends along the length of the strip.
30. A polymer article according to claim 29 wherein the compressed area is continuous in the longitudinal direction of the strip.
31. A polymer article according to claim 29 wherein the compressed area is discontinuous in the longitudinal direction of the strip.
- 25 32. A polymer article according to any one of claims 29 to 31 wherein the compressed area has a width transverse to the length of the strip.

33. A polymer article according to any one of the preceding claims wherein the compressed area provides the article with desired properties for the intended application of the article.

5 34. A polymer article according to claim 33 wherein the compressed area forms a hinge portion extending along the length of an elongate strip to be used as a masking material such that an adjacent portion of the strip can hinge relative to the compressed area.

10 35. A polymer article according to claim 33 wherein the compressed area provides a tab by means of which the article can be gripped to assist handling the article in use.

15 36. A polymer article according to claim 35 wherein the article is in the form of an elongate strip and the tab is continuous in the longitudinal direction of the strip.

20 37. A polymer article according to claim 35 wherein the article is in the form of an elongate strip and a series of tabs are provided spaced apart in the longitudinal direction of the strip.

38. A polymer article according to any one of the preceding claims wherein the compressed area includes a seam.

25 39. A polymer article according to claim 38 wherein the article is in the form of an elongate strip and the seam is continuous along the length of the article.

40. A polymer article according to claim 38 wherein the article is in the form of an elongate strip and the seam is discontinuous along the length of the article.

5 41. A polymer article according to any one of claims 38 to 40 wherein adjoining areas are separable along the seam.

42. A polymer article according to any one of claims 38 to 41 wherein two or more articles are formed together and releasably secured to each  
10 other by a seam allowing the articles to be separated from each other.

43. A polymer article according to any one of claims 38 to 41 wherein a tab is provided connected to the article by a seam allowing the tab to be removed after the article has been secured in place.

15

44. A polymer article according to any one of the preceding claims comprising an elongate foam strip for use as a masking material.

45. A method of marking an article of polymer material comprising  
20 shaping an area of the article by applying pressure to the polymer material and providing a surface pattern in the shaped area.

46. A method according to claim 45 wherein the surface pattern is formed during the shaping process to compress the polymer material.

25

47. A method according to claim 45 or claim 46 wherein the surface pattern is inset below the adjacent surface of the compressed area.

48. A method according to claim 45 or claim 46 wherein the surface pattern is raised above the adjacent surface of the compressed area.

49. A method according to any one of claims 45 to 48 wherein the  
5 surface pattern is produced by a shaping die forming the compressed area.

50. A method according to claim 49 wherein the die is provided with contact surface in which the surface pattern is raised above the contact surface.

10

51. A method according to claim 49 wherein the die is provided with a contact surface in which the surface pattern is inset below the contact surface.

15 52. A method according to any one of claims 45 to 51 wherein the surface pattern is applied to one side of the compressed area and forms a reverse pattern on the opposite side.

20 53. A method according to any one of claims 45 to 51 wherein the surface pattern is offset relative to a surface pattern applied to the opposite side of the compressed area.

25 54. A method according to any one of claims 45 to 51 wherein the surface pattern overlaps a surface pattern applied to the opposite side of the compressed area.

55. A method according to claim 53 or claim 54 wherein the surface patterns applied to both sides are the same.

56. A method according to claim 53 or claim 54 wherein the surface patterns applied to both sides are different.
- 5 57. A method according to any one of claims 45 to 56 wherein the shaping process is assisted by an additional input of energy.
58. A method according to claim 57 wherein the additional input of energy is provided by applying a higher pressure.
- 10 59. A method according to claim 57 or claim 58 wherein the additional input of energy is provided by applying heat.
60. A method according to any one of claims 57 to 59 wherein the  
15 additional input of energy is provided by electromagnetic radiation.
61. A method according to any one of claims 57 to 60 wherein the additional input of energy is provided by ultrasonics.
- 20 62. Apparatus for manufacturing an article of polymer material comprising means for compressing a portion of the article to form an area of reduced thickness, and means for providing a surface pattern in the area.
- 25 63. Apparatus according to claim 62 wherein the compression means comprise a former having a contact surface for forming the area of reduced thickness by compressing the polymer material.



64. Apparatus according to claim 62 wherein the surface pattern applying means comprises a portion of the contact surface in which the surface pattern is provided.

5 65. An elongate foam strip for use as a masking material to mask a gap between two relatively movable parts, the foam strip having an adhesive stripe for releasably securing the foam strip to one of the parts to close temporarily the gap, and a surface pattern provided in an area that has been formed to a desired shape under pressure.

10

66. A polymer article substantially as hereinbefore described with reference to the accompanying drawings.

15 67. A method of marking an article of polymer material substantially as hereinbefore described with reference to the accompanying drawings.

68. Apparatus for manufacturing an article of polymer material substantially as hereinbefore described with reference to the  
20 accompanying drawings.

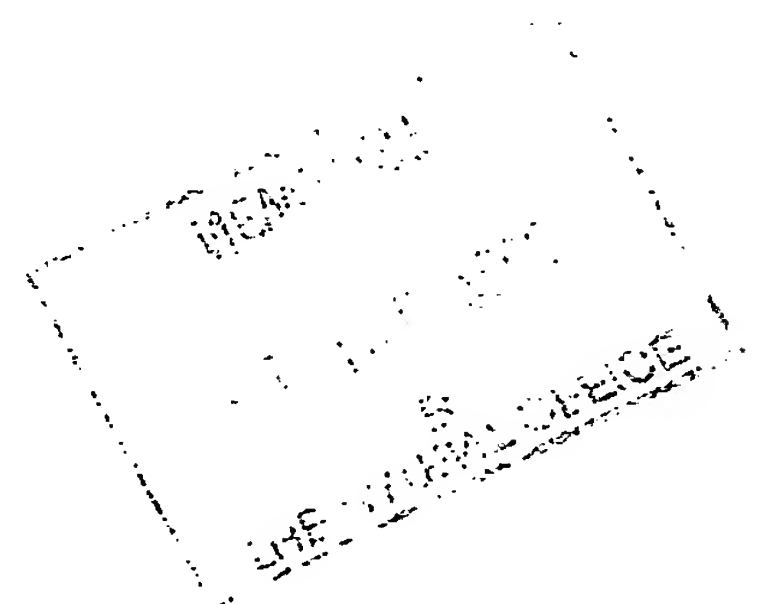
50. 69 Foam masking strip substantially as hereinbefore described with reference to the accompanying drawings.

25

**ABSTRACT**  
**PATTERNED POLYMER ARTICLES**

Articles 100 such as elongate strips 101, 101' for use as masking  
5 materials when spray painting a vehicle are formed from a compressible  
polymer material and provided with a surface pattern in an area 102 that  
has been deformed under pressure to retain a desired shape when the  
pressure is removed. The surface pattern may be decorative to enhance  
the aesthetic appearance of the article 100. Alternatively, the surface  
10 pattern may be functional to provide the article with desired properties  
and/or to present information to the user. The information may be in the  
form of letters, numbers, symbols, pictures or a combination of any of  
these to identify the article, its source or to provide instructions for its  
use. The surface pattern may be formed during the shaping process or  
15 applied separately after the shaping operation.

Figure 15.



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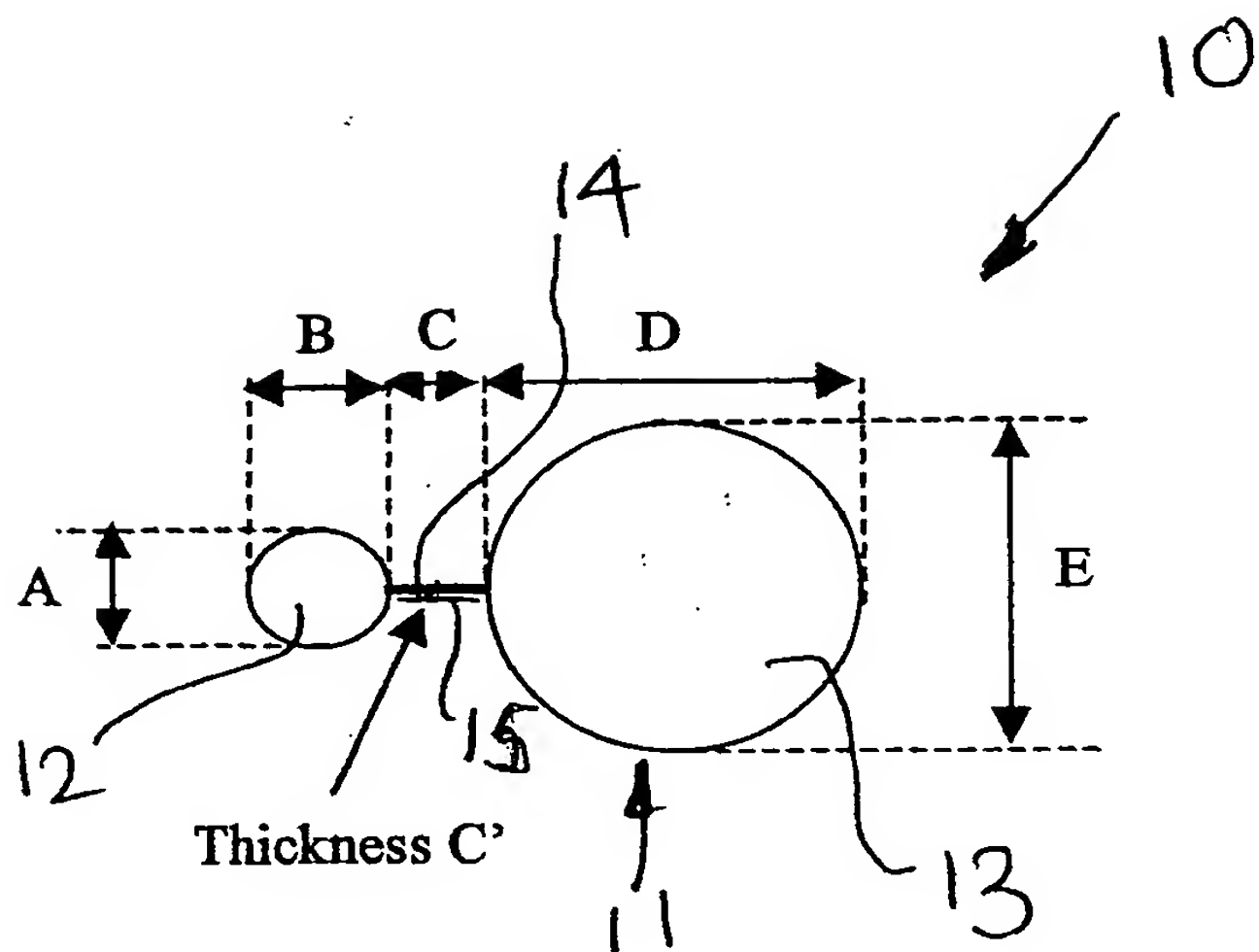


FIGURE 1

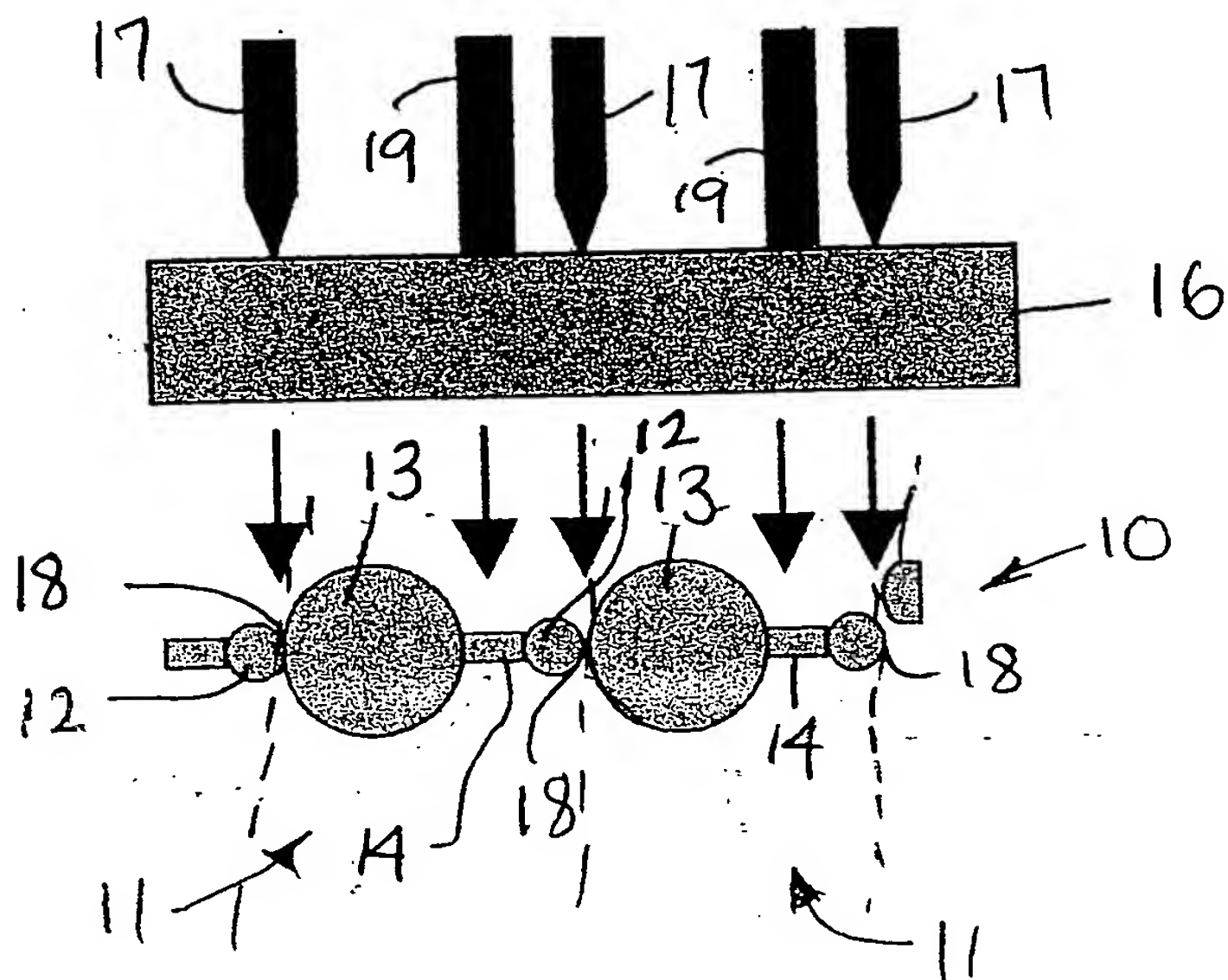


FIGURE 2



FIGURE 3



FIGURE 4



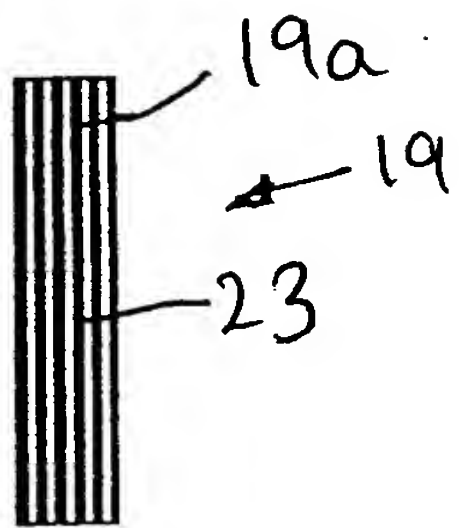


FIGURE 5

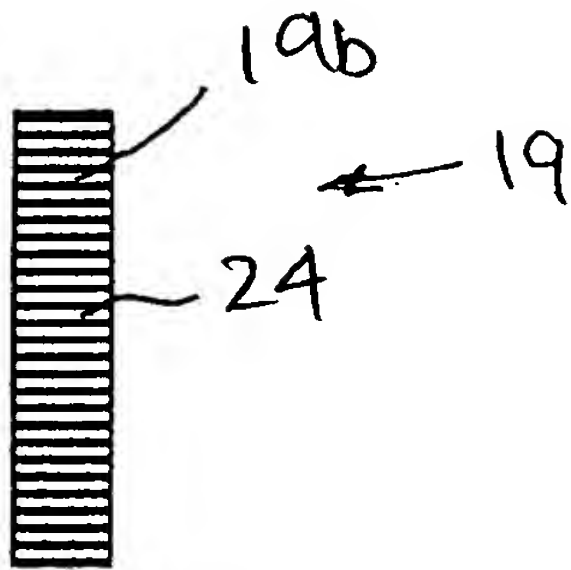


FIGURE 6

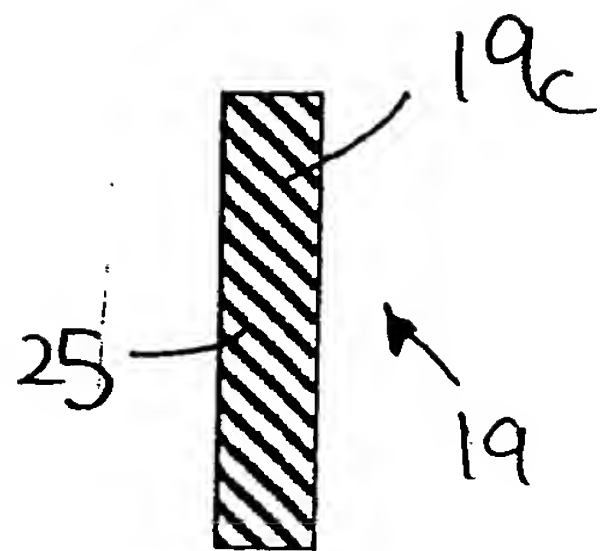


FIGURE 7

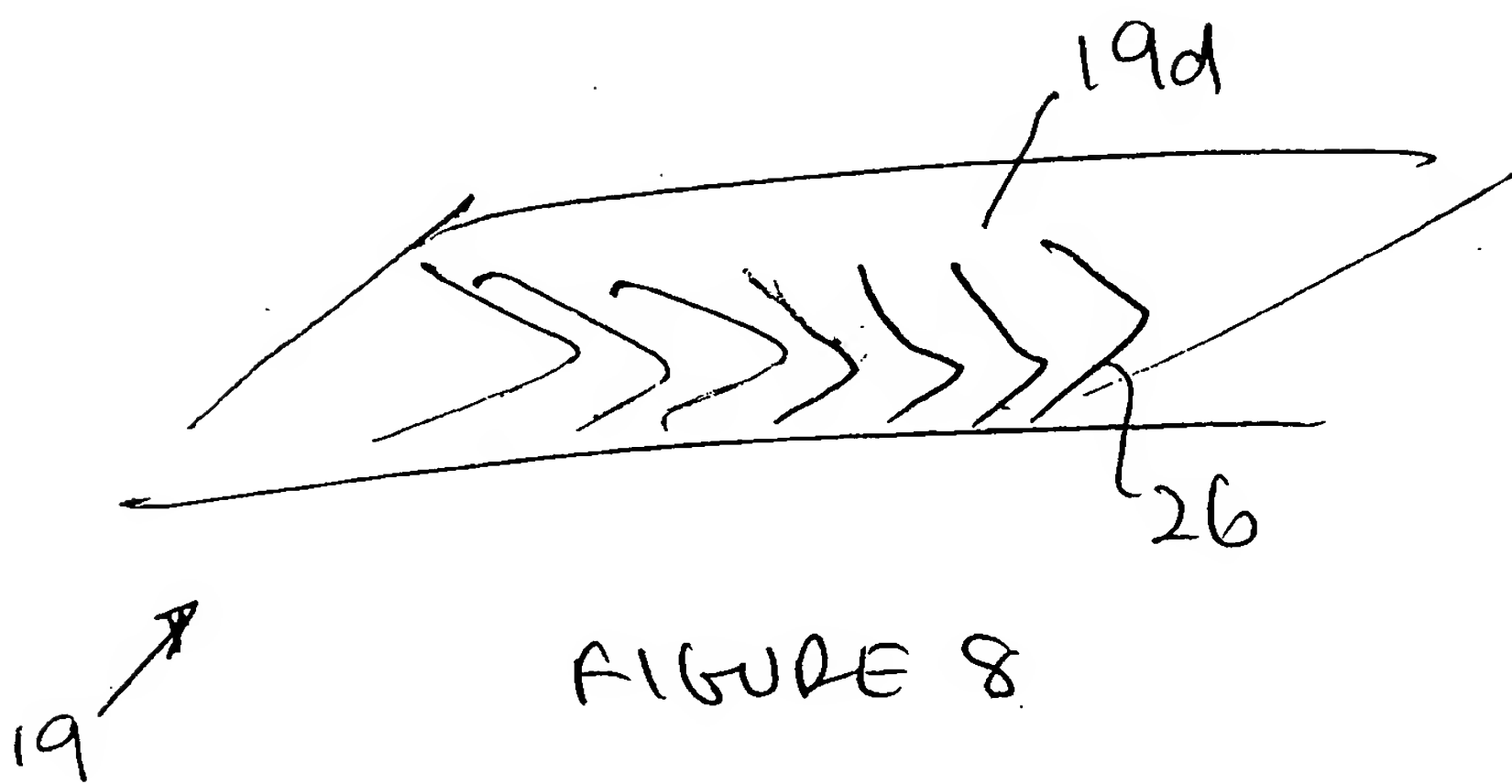


FIGURE 8

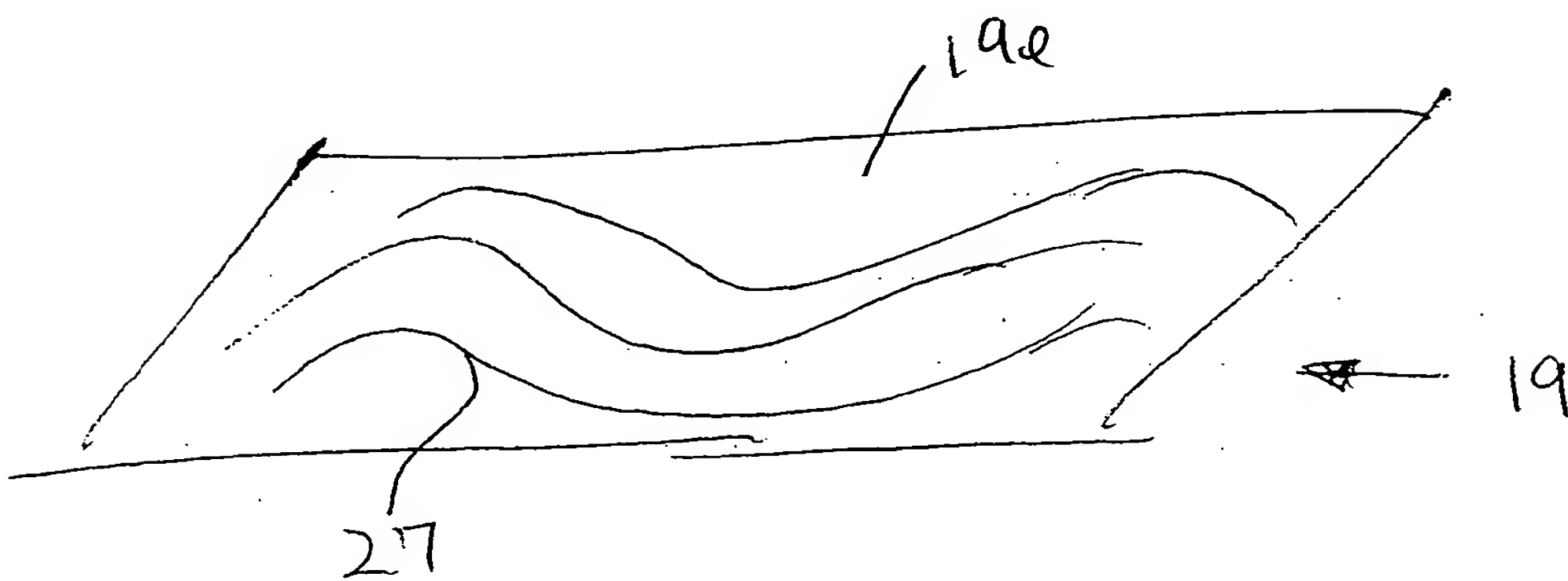


FIGURE 9





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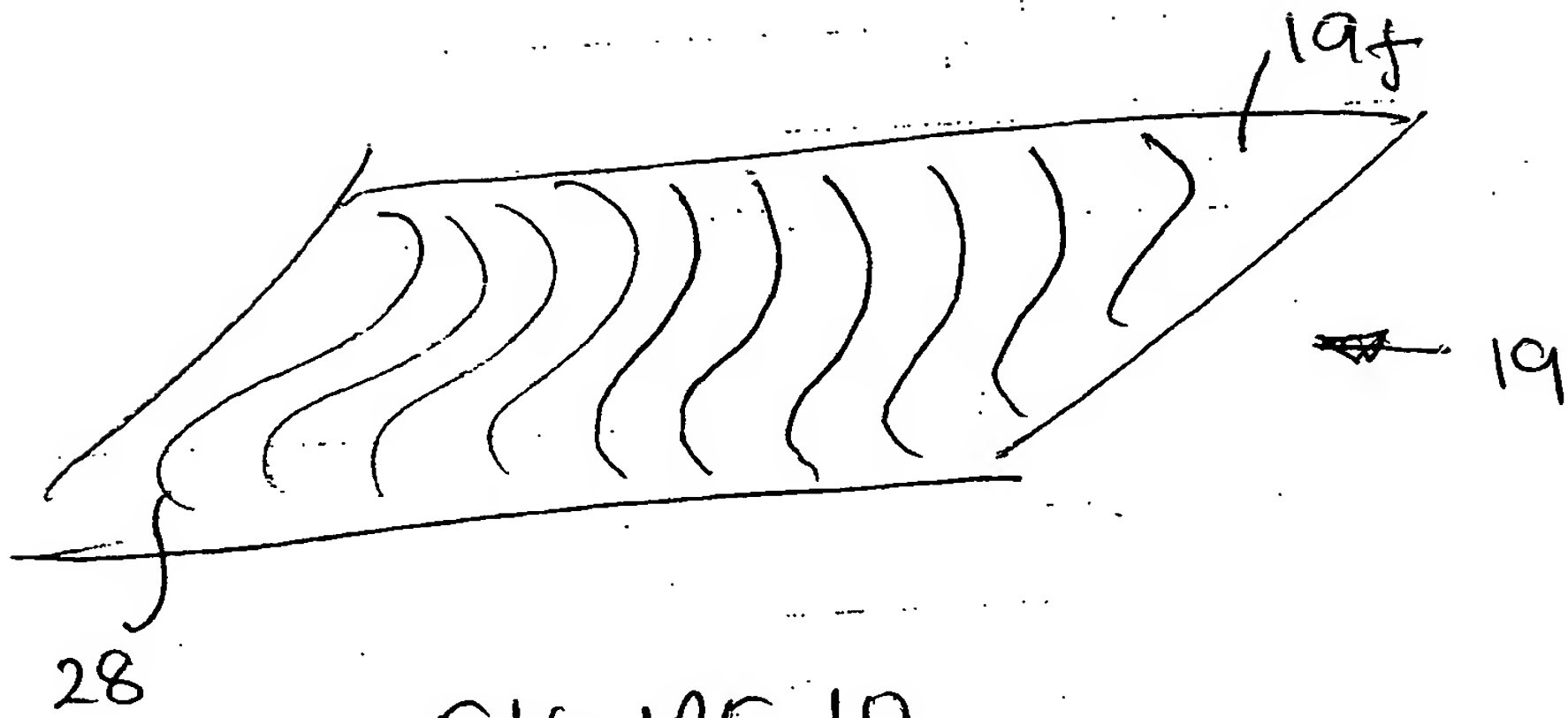


FIGURE 10

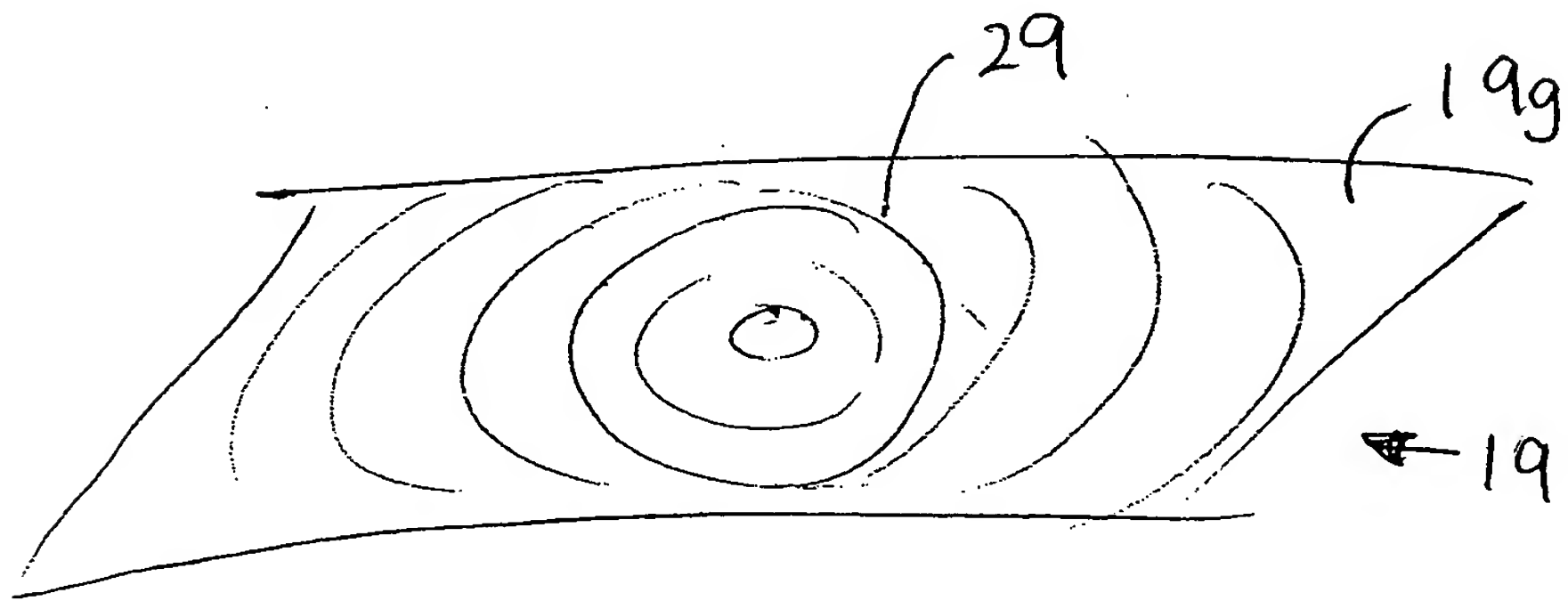


FIGURE 11

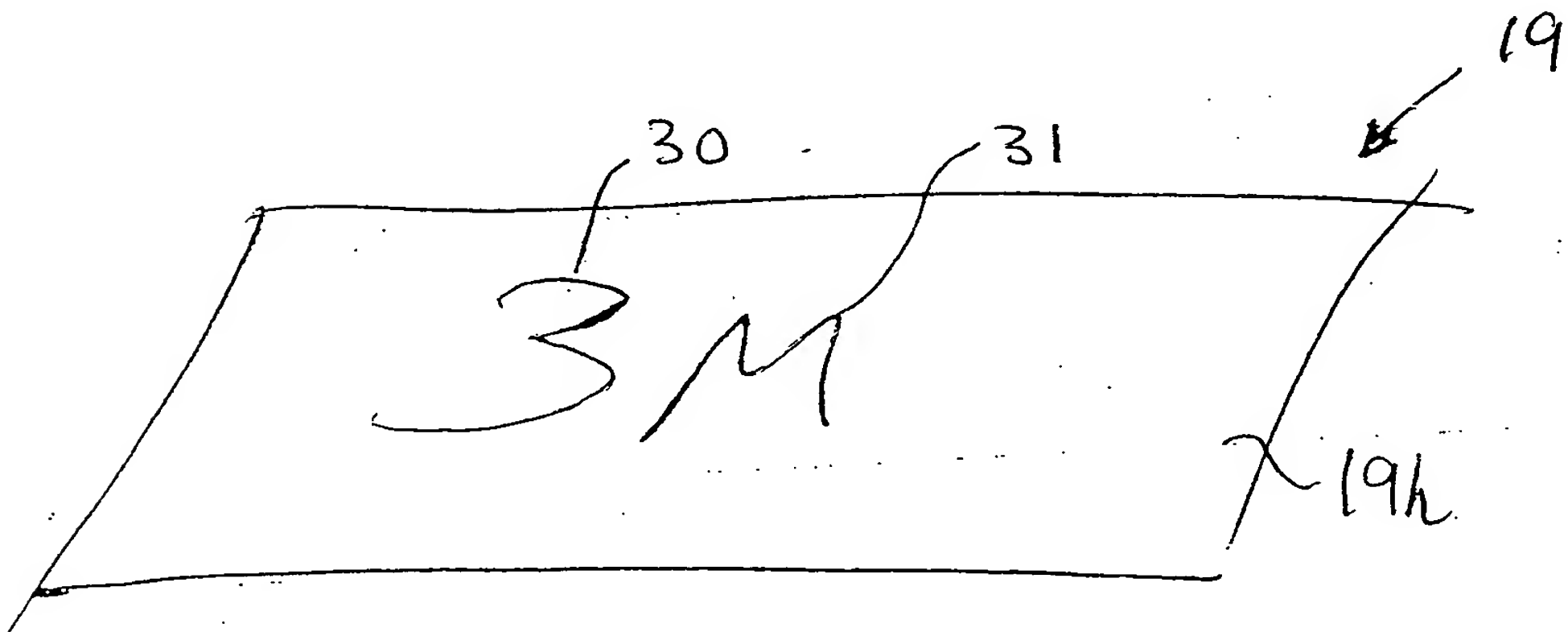


FIGURE 12



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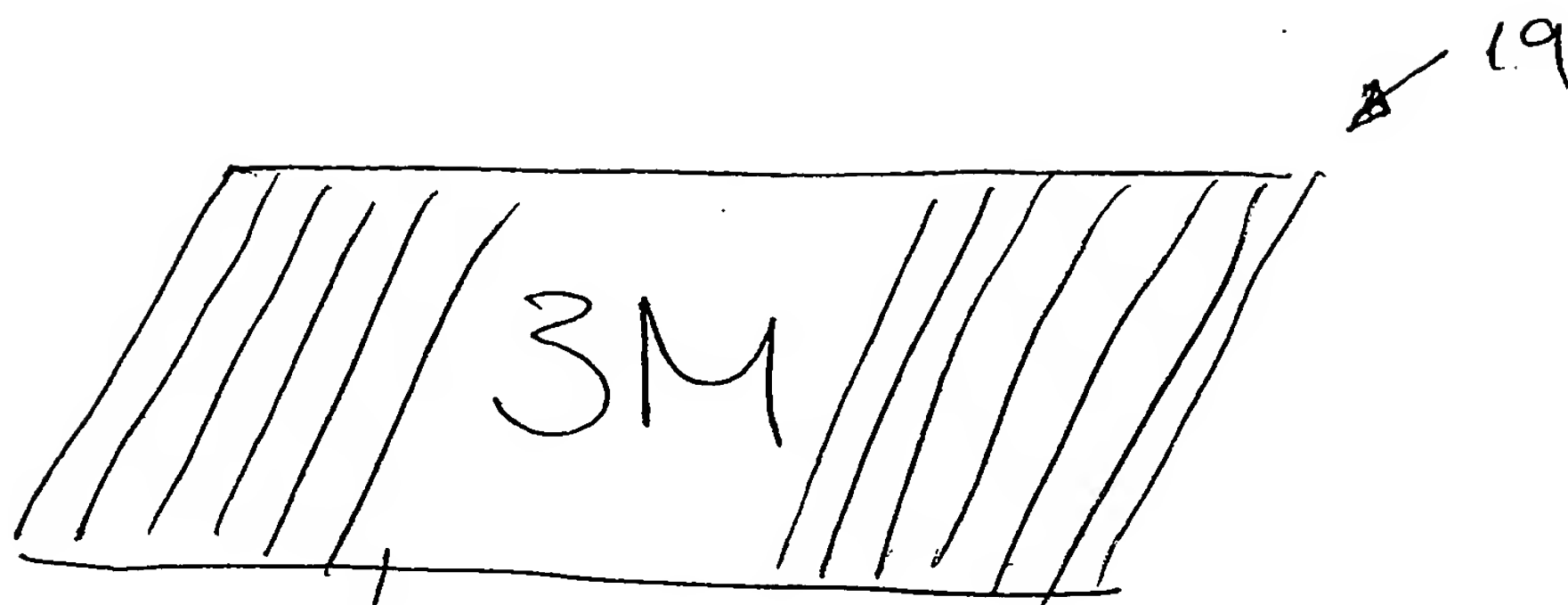
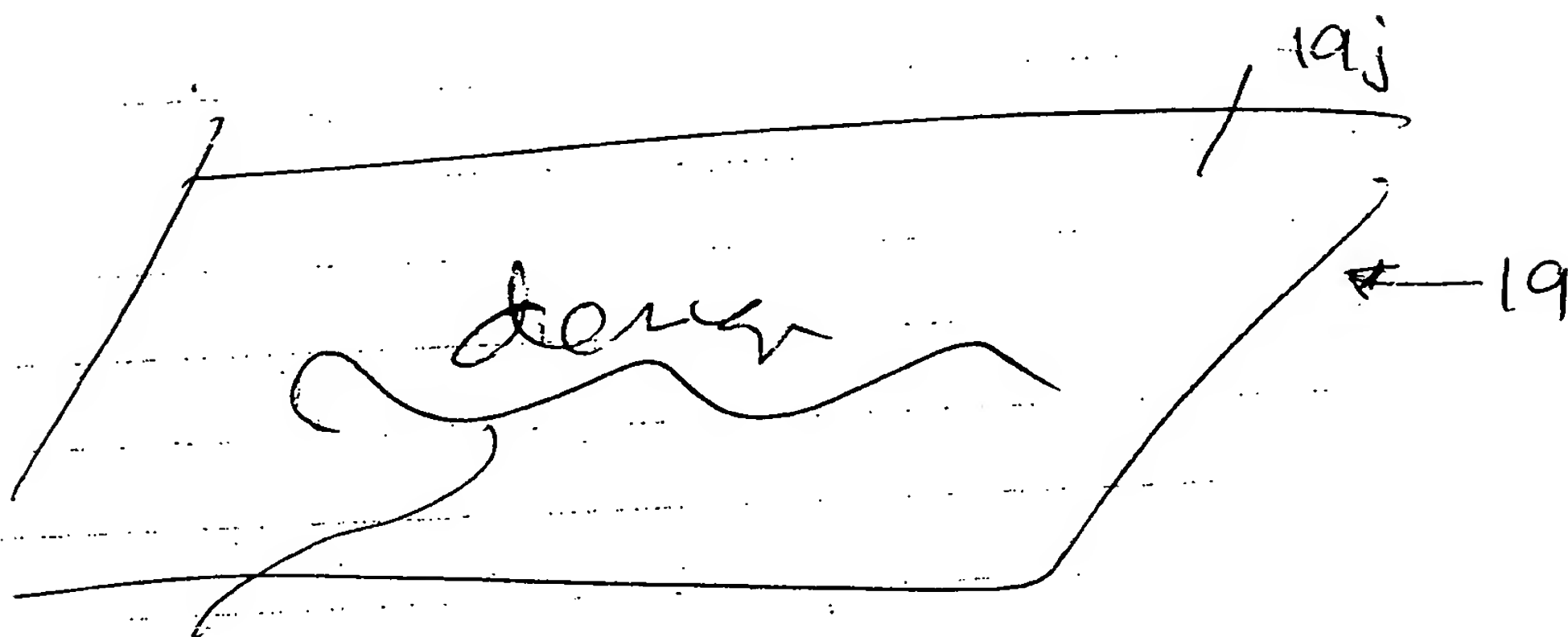


FIGURE 13



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FIGURE 14



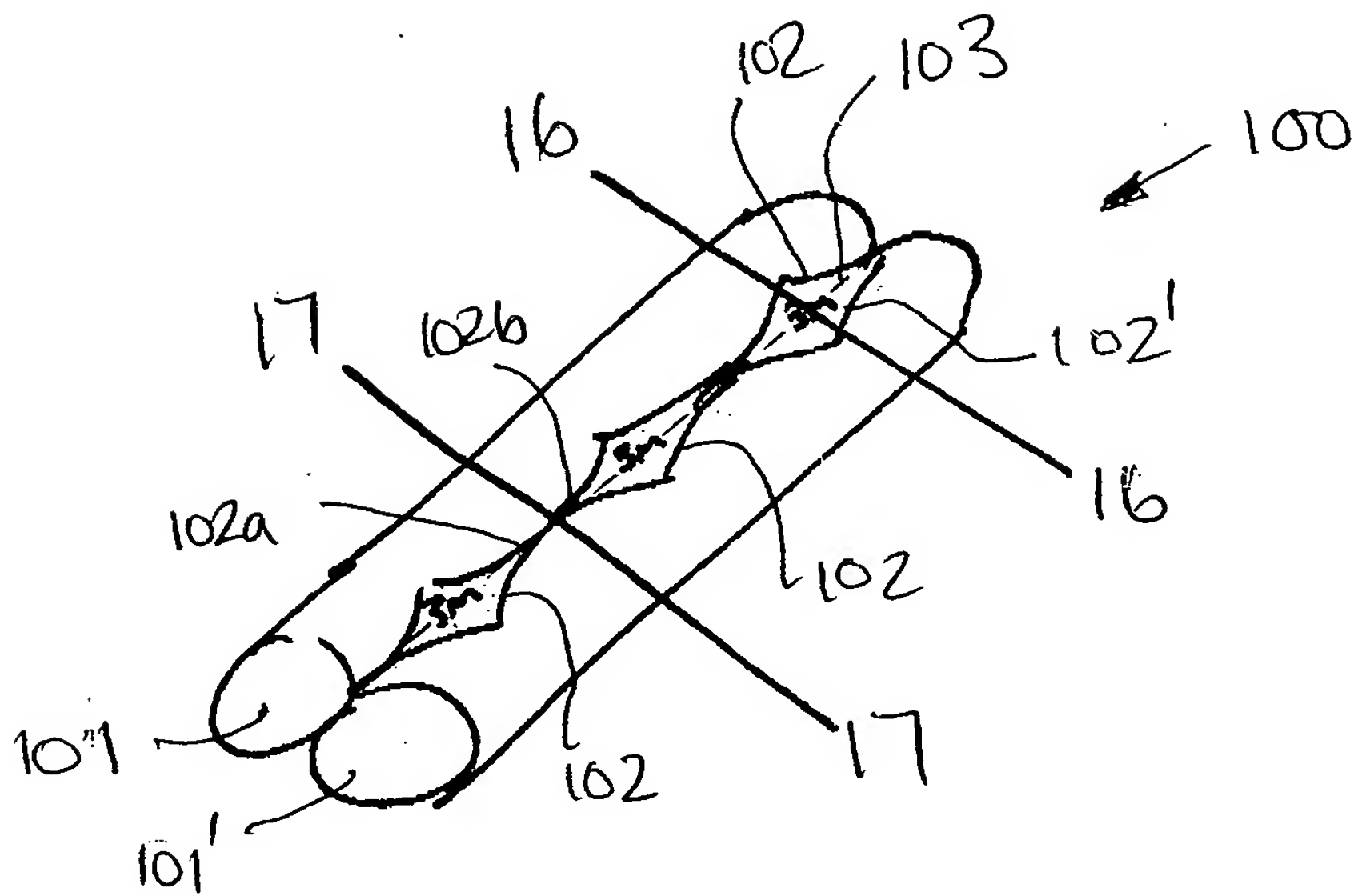


FIGURE 15

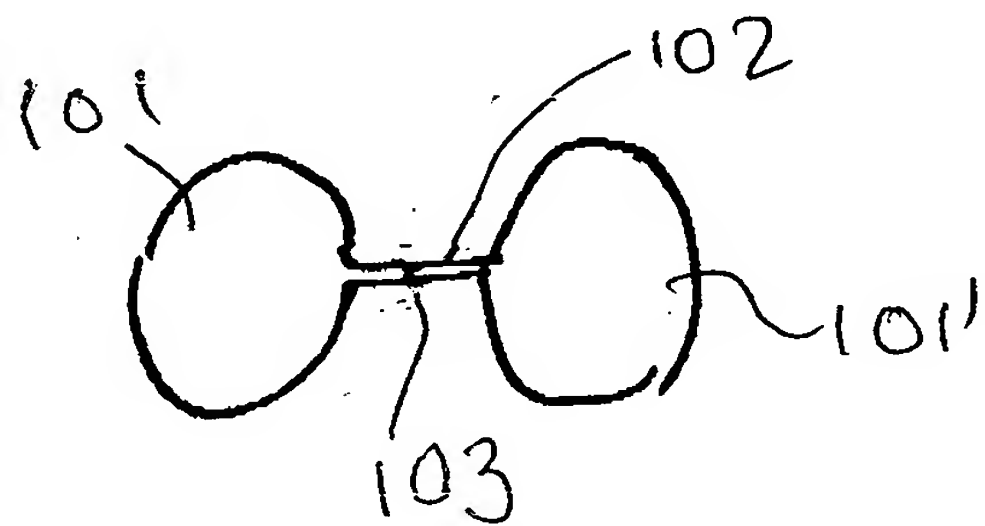


FIGURE 16

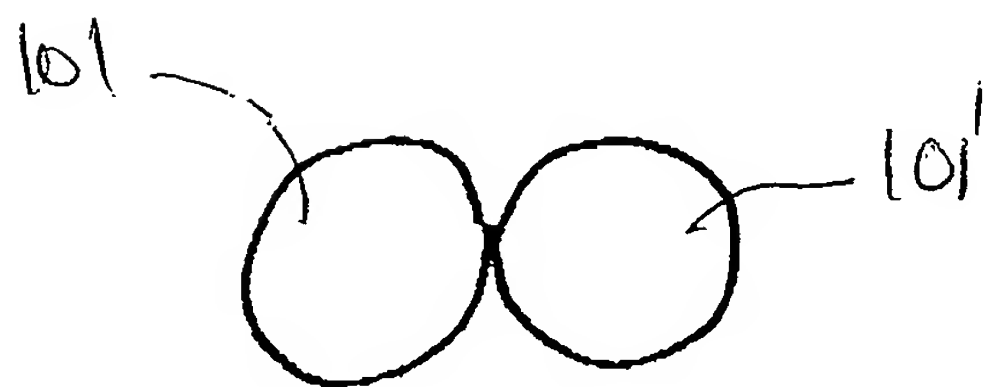


FIGURE 17



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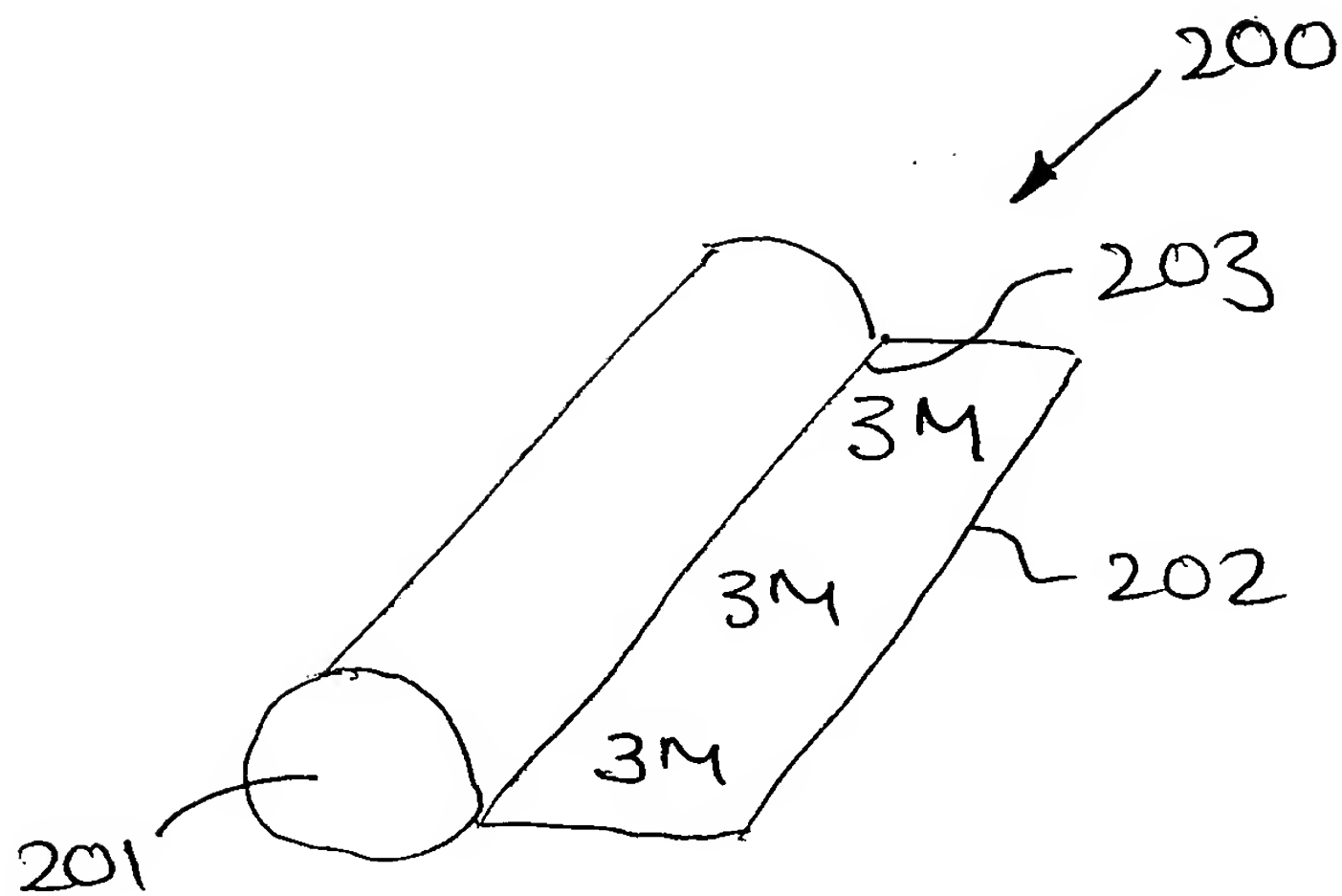


FIGURE 18

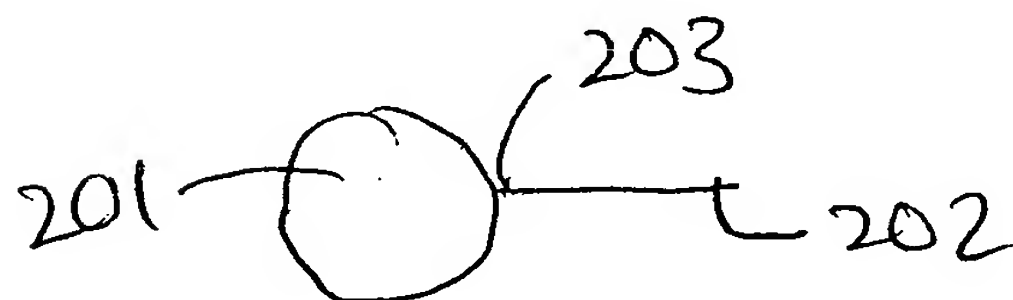


FIGURE 19



FIGURE 20





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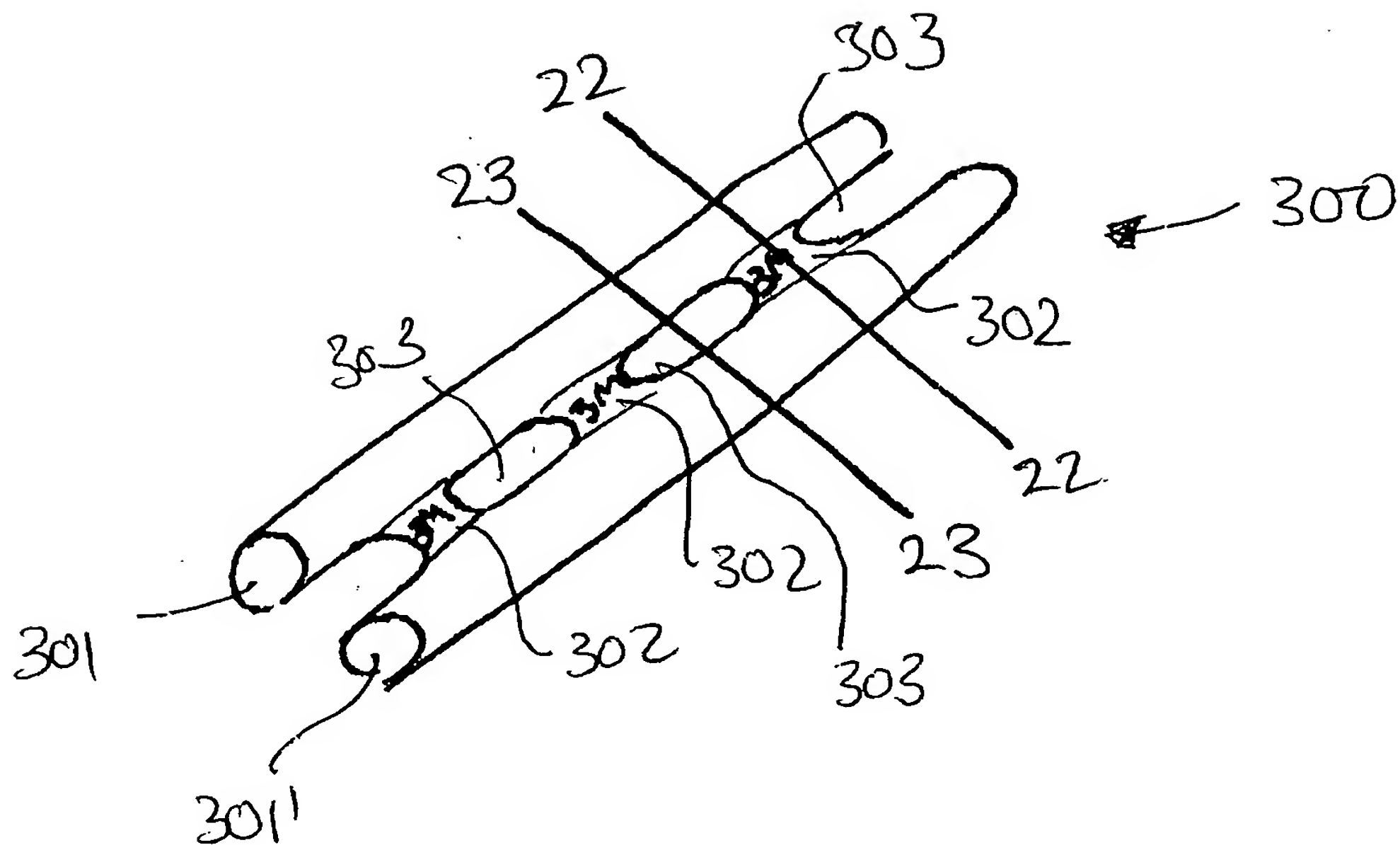


FIGURE 21

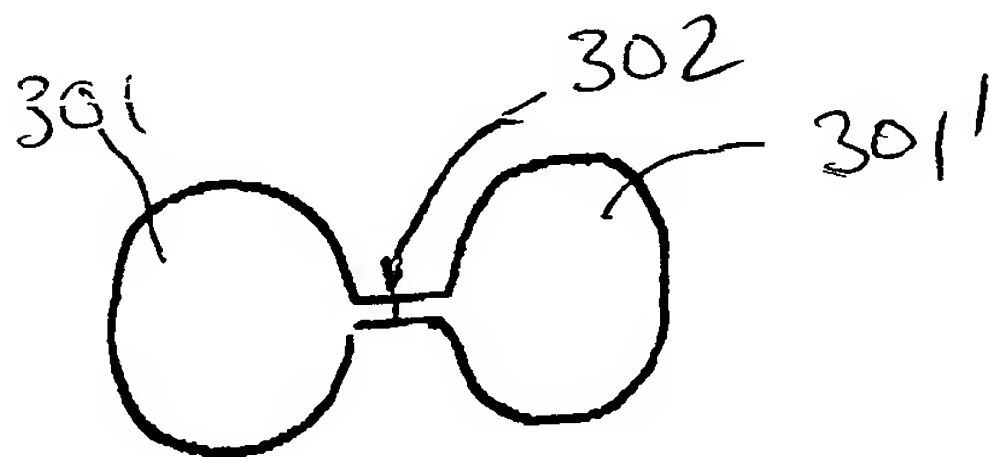


FIGURE 22

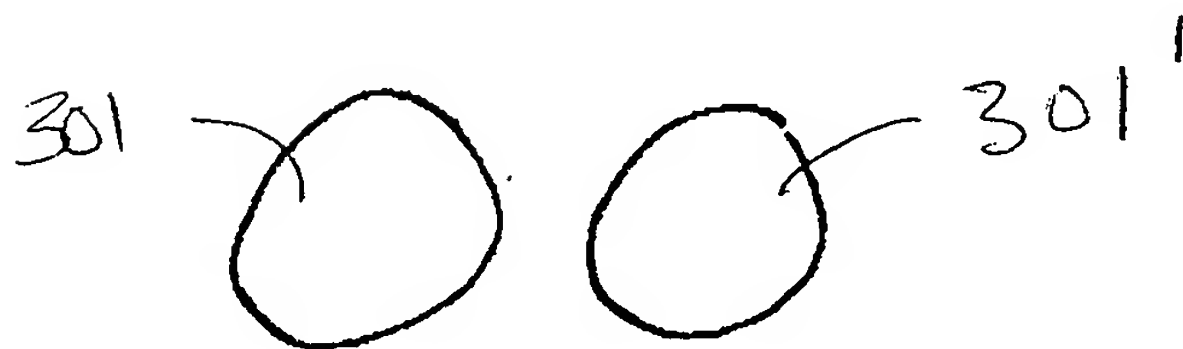


FIGURE 23



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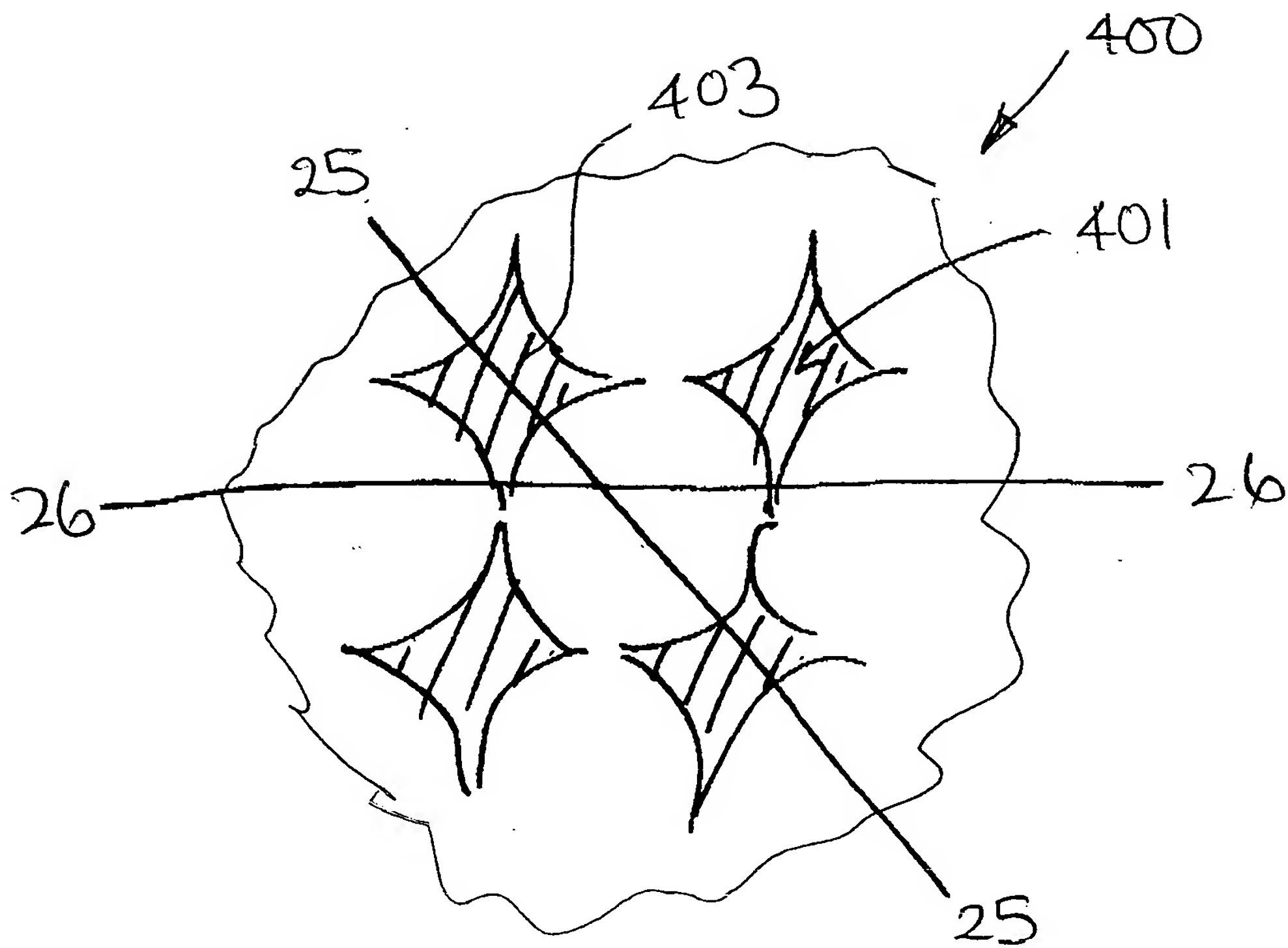


FIGURE 24

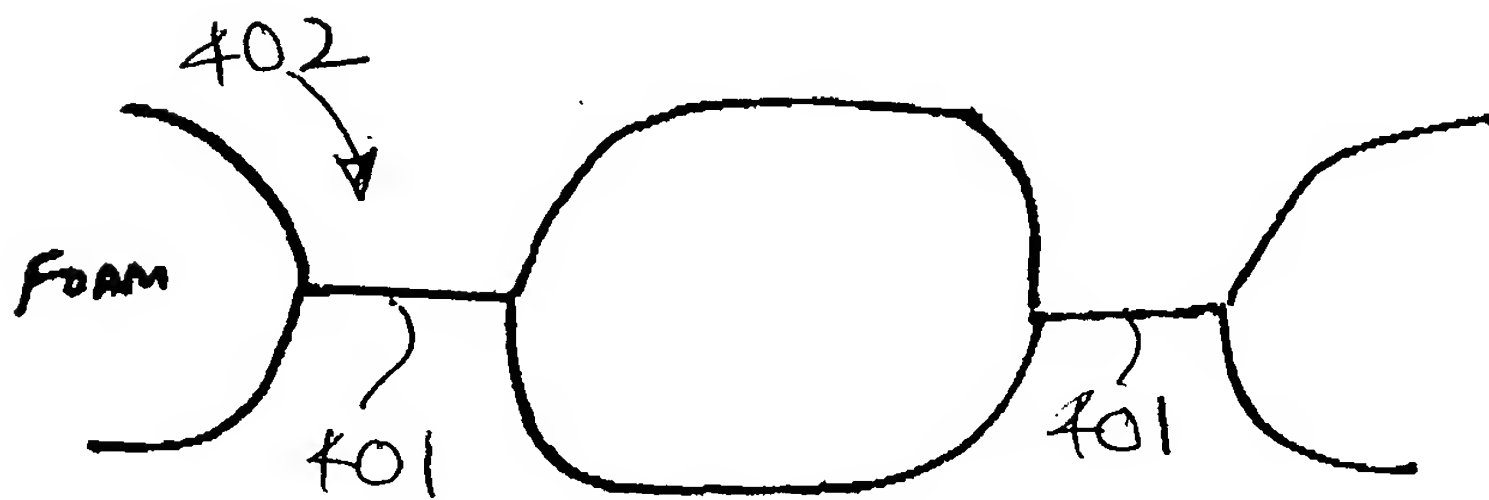


FIGURE 25

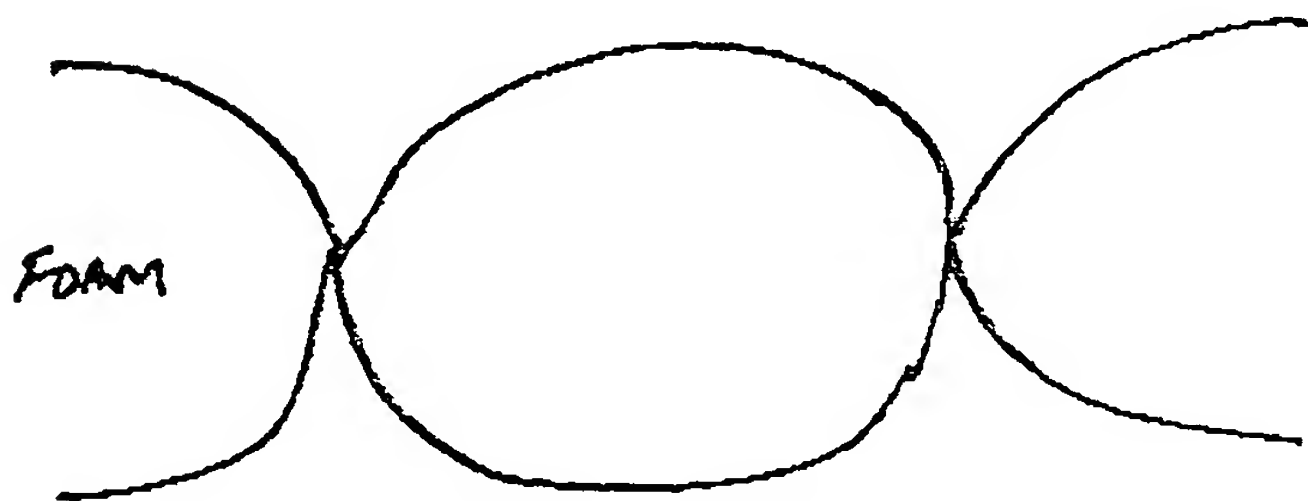


FIGURE 26



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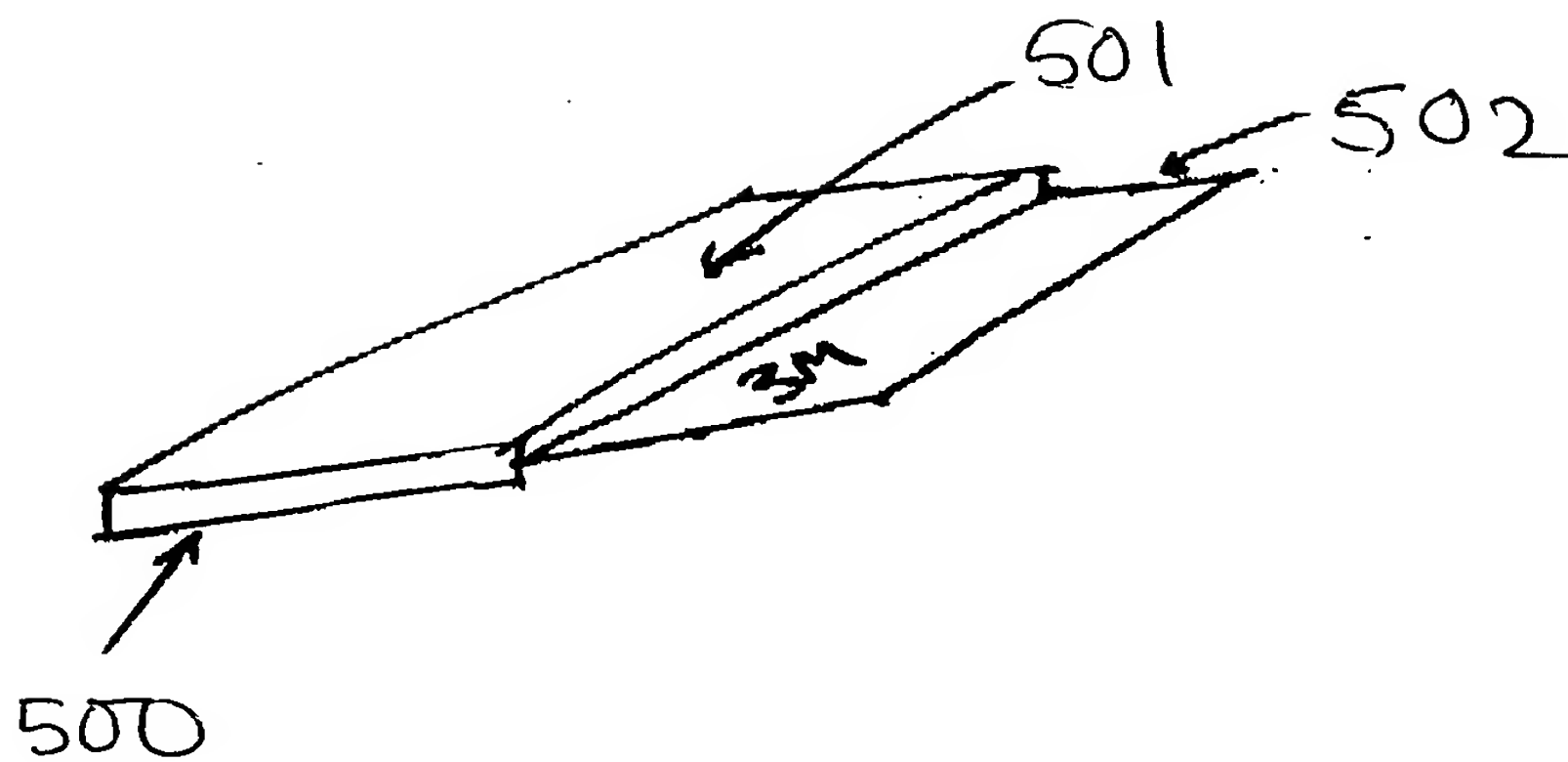


FIGURE 27

